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Exploring the impact of Covid-19 pandemic on eating and purchasing behaviours of people living in England

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Abstract: Consumers' eating habits have changed significantly due to the anxiety and boredom from the reported cases and deaths of Covid-19, the change in work patterns, controlled food shopping and the inability to meet loved ones during the lockdown. The magnitude of these changes in the eating behaviours and purchasing habits of consumers varies across different groups of people. This study provides empirical evidence on the effects of Covid-19 on the eating and purchasing behaviours of people living in England, which was assessed based on the sociodemographic variables. A total of 911 participants were recruited by a research market company, and only 792 useable responses were included in this study. The participants aged between 18 and 91 completed the online questionnaire and the data were analysed using ordinal regression. Data were collected between October and December 2020. Male participants constituted 34.60%, females 63.89% and others (other gender and those who prefer not to declare their gender) were 0.63%. Majority of participants' age fell into 23 – 38 and 39 – 54. Participants aged 23 to 38 years had the greatest effect of Covid-19 on their purchasing decision of healthier foods while participants in the age groups 55-73 and 74-91 were least affected. The amount of foods purchased during the pandemic decreased with increasing age. The amount of foods purchased by the students, people in employment and people from minority ethnic groups were greatly affected by the pandemic. All participants that stated taking food supplements is not important during the pandemic were from the White ethnic group. The effects of the pandemic on purchasing healthier foods were more in younger generations and participants in full or part time employment than participants who were retired and who were aged above 55. The participants with higher educational qualifications and those from the minority ethnic groups were also more affected by the pandemic. We suggest further studies to monitor any changes in the effects of the ongoing Covid-19 pandemic on the eating and purchasing behaviours of consumers.

Keywords: COVID-19 pandemic; public health; sociodemographic variables; eating behaviour; purchasing habits.

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1. Introduction

People eat for different reasons and the different foods they consume have effect on their day to day activities. Eating behaviours vary from person to person and could be determined by array of physiological, sociological, psychological, or nutritional factors,[1]. These needs were reported to be greatly affected by the effects of the pandemic of the coronavirus disease 2019 (Covid-19). Covid-19 is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2), and this infectious disease was declared a pandemic by the World Health Organization,[2]. The first case of Covid-19 was confirmed in the UK on 31 January 2020, and several measures[1] were put in place to curb its spread. In the UK, the impacts of Covid-19 on people were reported as psychological

[1] Wash hands regularly, cover face by wearing a face covering in enclosed spaces and make space by staying at least 2 metres apart - or 1 metre with a face covering or other precautions

imbalance,[3] negative physical and mental wellbeing,[4] and changes in weight and nutritional habits,[5].

The global impacts of the Covid-19 pandemic could be seen in all areas of public health such as human, medical, biological and social sciences, which has led consumers to have higher preference for organic foods, legumes, seafoods, fruits and vegetables,[6,7]. Consumers were reported to now choose diets to be safe and healthy than for any other reasons such as environmental sustainability and improving personal appearance,[8]. During the Covid-19 pandemic, Ammar *et al.*,[9] saw a decrease in the consumption of alcoholic drinks but eating patterns were out of control. It was also reported that the Turkish university students claimed they ate a lot more during the pandemic, and that more attention was given to hygiene after food shopping,[10].

Existing studies pinpointed that anxiety, boredom, confinement to home during the lockdown and regulated shopping by the retailers contributed to a shift in eating behaviours during the Covid-19 pandemic, [6,11,12,13]. Only a few of these studies measured the effects of Covid-19 on the sociodemographic characteristics of consumers. For empirical evidence on the impacts of Covid-19 on consumers' health and diet during the pandemic, it was recommended that the levels of effects should be investigated in specific locations and among different categories of people, [9,14]. This is because, the ripple effects of Covid-19 on the economy, health, wellbeing, and diet differ from region to region and individual to individual. This study aims at measuring the impact of Covid-19 on the eating and purchasing behaviours of people living in England based on the sociodemographic variables. The study appraises the empirical findings in line with the hypothesised opinions made on the impacts of Covid-19 pandemic on consumers` attitudes relative to age, ethnicity, education, gender, and the employment status of people that live in England. Peer reviewed articles and grey literatures with relevant theoretical framework that underpin food choice, consumer behaviours and impacts of Covid-19 pandemic were used to construct a conceptual framework that gives a general overview of the study,[15,16,17,18].

2. Methods

An online survey deploying a validated structured questionnaire was used. The questionnaire was developed to collect information from the respondents` diets and consumer behaviours during the Covid-19 pandemic. The recruitment of participants, questionnaire launching, and data gathering were carried out in November and December 2020.

The questions were developed to include the change in the amount of food products consumed, alterations in consumers` purchasing decision and how the choice of foods and supplements were affected during the Covid-19 pandemic (Table 1). Two stages of validation (face and content validity), were used to test the reliability of the questions. Face validity was carried out to measure if the questions actually measured the objectives of the study, and the content validity assessed whether every question is a representative of all the aspects of the construct. A validation sheet that comprises two sections was created. The first section is where the readability, comprehensiveness and clarity of the questions were rated on a 1 to 5 Likert scale, ranging from highly favourable to highly unfavourable, and the second section is where the validation panel expressed their feelings on the questions and provided their comments and suggestions. The validation panel consisted of professionals in food and nutrition education, and public health. The set of data obtained from the validation study was analysed using the Statistical Package for Social Sciences (SPSS) version 27.

Table 1. Participants` responses (n=792).

Questions	Responses, presented as percentage and number of participants				
1. How often did you shop for food before the Covid-19 pandemic?	**Monthly**	**Fortnightly**	**Weekly**	**Every other day**	**Every day**
	11.74% (n=93)	14.77% (n=117)	53.79% (n=426)	17.05% (n=135)	2.65% (n=21)
2. How has Covid-19 pandemic affected the frequency of your food shopping?	**I now shop more online**	**I now shop more in-store**	**I still buy in-store, but the frequency has reduced**	**No difference**	
	29.67% (n=235)	15.28% (n=121)	29.42% (n=233)	25.63% (n= 203)	
3. Has the Covid-19 pandemic affected the choice of the food you eat or purchase?	**Yes**		**No**		
	44.44% (n=352)		55.56% (n=440)		
4*. To what extent did Covid-19 pandemic affect the amount of the food products that you buy?	**Greatly**	**Moderately**	**A little bit**	**Not at all**	
	15.53% (n=123)	38.01% (n=301)	23.23% (n=184)	23.23% (n=184)	
5*. To what extent has the Covid-19 pandemic affected your decision on considering the purchase of healthier foods?	**Greatly**	**Moderately**	**A little bit**	**Not at all**	
	19.57% (n=155)	33.96% (n=269)	24.24% (n=192)	22.22% (n=176)	
6*. How important do you think it is to take food supplements and products that boost the immune system during Covid-19 pandemic?	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not at all important**
	20.33% (n=161)	29.67% (n=235)	26.39% (n=209)	11.11% (n=88)	12.50% (n=99)

* Questions with responses that were significant when categorised based on sociodemographic variables.

A pilot study was carried out to further test the validity and the reliability of the questionnaire and 56 respondents took part in the pilot study. The results of the pilot study helped in adjusting the questions for more clarity and understanding. The participants` responses are secured and were only viewed by the organisers of the survey. Prior to the launching of the survey, the ideal sample size of 750 was under consideration from the sample size calculation at a confidence level of 95% and margin error of 5%. Based on this scientific calculation, the result of this study is therefore believed to be a representation of the population of England.

The participants were recruited by a professional market research company and only those individuals that reside in England were screened for participation. Participants below 18 years were excluded because they are a vulnerable population whose eating and purchasing decisions can easily be influenced, [19,20]. The link to the survey was sent to the potential participants and each participant gave their consent to participate before completing the questionnaire. Participants were assured that the data obtained from the study will only be used for statistical and academic purposes. The participants who do not meet the criteria of age, region and who were not willing to consent were

automatically screened out by the software used. The incentive that was given to the participants was arranged by the research marketing company.

Before data analysis, the following hypotheses were made regarding the questions that the participants were asked about their eating and purchasing behaviours during the Covid-19 pandemic.

Hypothesis 1: The amount of foods that consumers buy during Covid-19 pandemic should be affected because of the effect of stockpiling and restricted shopping by the supermarkets.

Hypothesis 2. The decision to buy healthier food products would be affected with increasing age.

Hypothesis 3. Food supplements and foods that support immune system are expected to be consumed more by the elderly.

Hypothesis 4. The higher the education status, the less the decision on choice of healthier foods are affected by Covid-19.

The Qualtrics software that was used to launch the questionnaire automatically analysed the data collected, and provided the Mean, Standard Deviation and Variance of the data categories. Ordinal regression was used to determine the significance of the questions in relation to the demographic information of the participants. R software version R 3.6.2 was used to carry out ordinal regression on the survey data that was downloaded from Qualtrics. To avoid the likelihood of multiple comparisons of the responses, the p-value threshold was therefore reduced across the tests from 5% that is normally used in statistical analysis. A false-discovery-rate[2] (FDR) analysis (as shown in Figure 1) was done on the data set to achieve the reduction, and a FDR cut off p-value of 0.0044 ($p<0.0044$) was used instead of 0.05 to enhance the credibility of the results. The statistical significance was therefore set at a p-value of 0.0044 and all the coefficients from the ordinal regression below 0.0044 were significant. To further increase the accuracy of the results, the sociodemographic variables of the participants were used as covariates[3].

2.1. Public involvement

The perceptions of the members of the public on the research questions were provided during the validation, piloting, and the main data collection stages. The responses of the participants were anonymous, and no participant could be identified by their responses. Nonetheless, in the participant information sheet, the participants were given the right to request for the outcome of the study by contacting the researchers. The participants were given opportunities of refusal to participate and withdrawal from the survey before their responses were submitted. All the respondents gave consent to participate in the study and all the information collected are for statistical and academic purposes only. There was no involvement of the public in the interpretation, reporting or disseminating the findings of this study.

3. Results

3.1. Sociodemographic characteristics of the participants

A total of 911 residents of England took part in the survey, which was greater than ideal sample size, which was 750. As shown in Table 2, these participants comprise 63.89% (n=506) female, 34.60% (n=274) male, 0.38% (n=3) preferred not to declare their gender and 0.25% (n=2) said their gender could only be described in another way. The Millennial age classification that grouped participants into generations was used in this study since people in the same generation are believed to have the same experience and behaviours,[21]. The majority of the participants (43.94%) fell into the age group of 23-38 years, 31.57% were in 39–54 and people in the age group of 55–73 was 15.40%. The participants who

[2] The false discovery rate reduces "false positives" (wrongly significant results) to a manageable level when conducting "multiple comparisons"

[3] A covariate is a possible predictive or explanatory variable of the dependent variable.

were in 18-22 years age group were 8.33%, 0.63% were in the age group of 74–91 and 0.13% did not identify with any age group.

Table 2. Sociodemographic characteristics of the participants (n = 792)

Variable	Characteristics	Frequency	Percent (%)
Age	18 - 22	66	8.33
	23 - 38	348	43.94
	39 - 54	250	31.57
	55 - 73	122	15.40
	74 - 91	5	0.63
	Prefer not to say	1	0.13
Gender	Male	274	34.60
	Female	506	63.89
	In another way	2	0.25
	Prefer not to say	3	0.38
Ethnicity	Asian or Asian British	77	9.72
	Black, African, Black British or Caribbean	38	4.80
	Mixed or multiple ethnic groups	20	2.53
	White. This includes any White background	638	80.56
	Another ethnic group, for example, Arab	8	1.01
	Prefer not to say	11	1.39
Highest level of education	Secondary school	179	22.60
	College or vocational training	249	31.44
	Undergraduate	210	26.52
	Postgraduate	134	16.92
	Other	7	0.88
	Prefer not to say	13	1.64
Employment status	Employed / self-employed full time	365	46.09
	Employed / self-employed part-time	153	19.32
	Full time student	39	4.92
	Retired	50	6.31
	Unemployed	99	12.50
	Currently looking for work	28	3.54
	Other	41	5.18
	Prefer not to say	17	2.15

The UK government`s five categories of ethnicity3F[4] were used in this study, and most of the participants were from the White ethnic group (80.56%). Participants from Asian or Asian British ethnic group were 9.72%, Black, African, Black British or Caribbean were 4.80% and mixed or multiple ethnic groups were 2.53%. People who are categorised as 'Other ethnic group' in the UK such as the Arabs were also represented, and 1.39% of them took part in the study. Regarding their highest level of education, 97.48% of the participants had at least a secondary school qualification, 0.88% had other qualification and 1.64% preferred not to say the type of qualification they held. While 65.41% were in full or part time employment, 6.31% were retired and 16.04% of them were unemployed or currently seeking for job.

3.2. Eating and purchasing habits during Covid-19 pandemic

[4] https://www.ethnicity-facts-figures.service.gov.uk/style-guide/ethnic-groups

Table 1 clearly shows that there was a shift in consumers' behaviours in making informed decision on food choice, the amount of food purchased and shopping habits of consumers in England during the Covid-19 pandemic. Only 25.63% of the participants said the frequencies of their food shopping were not affected by the pandemic, however, the pandemic made 29.67% (n=235) of the participants to shop more online, 29.42% still buy in-store but at a reduced frequency, and 15.28% shop more in the stores. The pandemic was reported to have affected the choice of the foods that 44.44% of participants eat or purchase and the amounts of food products purchased were greatly affected in 15.53% (n=123) of the participants. The decisions to purchase healthier food products where affected in 77.77% of the participants, and only 12.50% of the participants said that the consumption of food supplements and foods that support the immune system was not at all important during the Covid-19 pandemic.

The ordinal regression analysis showed significant differences in the responses to some questions (Questions 4, 5 and 6) that were presented in Table 3, and Figures 1 to 4. It could be seen that age, gender, education, ethnicity, and employment status had significant effects on consumers` eating and purchasing habits. In fact, significant differences across the sociodemographic variables among the participants.

Table 3. Significant p and false discovery rate (FDR) cut-off values for questions (4, 5 and 6)[†] with significant coefficients.

			Gender		**Ethnicity**			**Employment**					
Question	**Age**	**Education**	Male vs Female	In another way vs Female	Black. vs Asian	Mixed vs Asian	White vs Asian	Others vs Asian	Retired vs Full time	Unemployed vs Full time	Part time vs Full time	Jobseeker vs Full time	Student vs Full time
4	**0.00014 (-0.36224) ***	0.00182 (**0.21880**) *	0.87537 (0.05930)	0.87537 (-0.37601)	0.00033 (-0.33370)	0.00033 (-0.77946)	0.00033 (**-1.02145**) *	0.00033 (-0.57295)	0.00226 (**-1.07286**) *	0.00226 (**-0.69365**) *	0.00226 (-0.07882)	0.00226 (-0.37938)	0.00226 (-0.28791)
5	0.08377 (-0.15917)	0.00510 (**0.19110**) *	0.36787 (-0.10886)	0.36787 (-1.39311)	0.00019 (-0.27200)	0.00019 (0.07469)	0.00019 (**-0.88832**) *	0.00019 (0.26095)	0.04602 (**-0.90428**) *	0.04602 (-0.24688)	0.04602 (-0.30120)	0.04602 (-0.23764)	0.04602 (-0.49209)
6	8.32E-05 (**-0.36309**) *	0.29583 (0.07191)	0.19271 (-0.16172)	0.19271 (1.80691)	0.00175 (**-0.85021**) *	0.00175 (-0.90174)	0.00175 (**-0.92459**) *	0.00175 (0.06229)	0.00309 (**-0.81888**) *	0.00309 (**-0.74525**) *	0.00309 (-0.19288)	0.00309 (-0.55293)	0.00309 (-0.51965)

The values are presented as a(b), where a is $p<0.05$, and b is the FDR cut off value. Bolded coefficients with * are more than twice the standard error and significant at the FDR cut off level of 0.0044, which is a reasonable criterion for judging the significance of the coefficients.

[†] Questions

4. To what extent did Covid-19 pandemic affect the amount of the food products that you buy?
5. How important do you think it is to take food supplements and products that boost the immune system during Covid-19 pandemic?
6. To what extent has the Covid-19 pandemic affected your decision on considering the purchase of healthier foods?

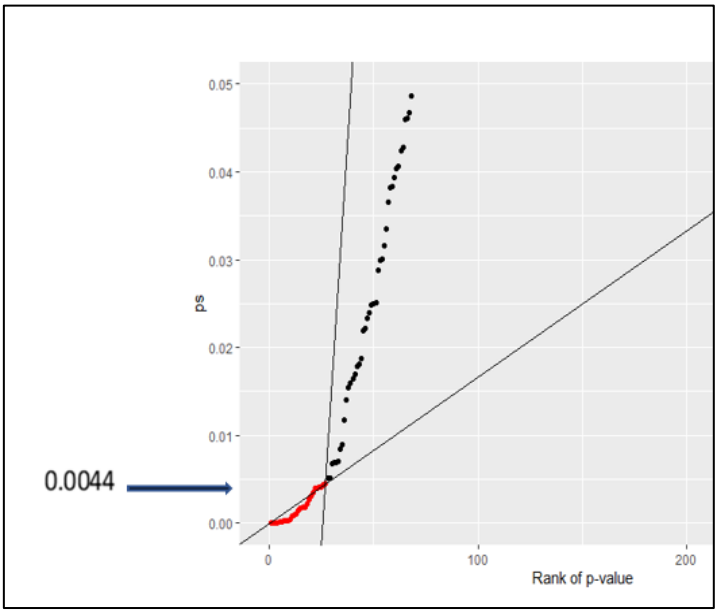

Figure 1. False discovery rate (FDR) for the validation tests.

(a). Effects of Covid-19 pandemic on the amount of food purchased by participants (Question 4)

When participants were asked if the pandemic affected the amount of foods they purchase, significant differences were seen among different ages, ethnic groups, level of education and employment status. As shown in Fig. 2, the effect of Covid-19 on the amount of foods bought during the pandemic decreased with increasing age groups. While 21% of the participants in the age group of 18-22 stated that the amount of foods they bought were greatly affected by Covid-19, all the participants whose ages were 74-91 claimed that they were only affected a little bit or moderately. Although 6% of the participants in 55 - 73 said they were greatly affected by the Covid-19 pandemic, 47% professed that they were not affected at all. The amounts of foods purchased during the Covid-19 pandemic were greatly affected in participants from the Black, Asian and Minority Ethnic groups (BAME). Although the Asians were the most affected, more than 25% of participants from each of BAME group were greatly affected, and about 50% of each said they were affected moderately or a little. The amounts of foods bought by the participants from White ethnic group were the least affected, in fact 26% of them said that they were not affected at all.

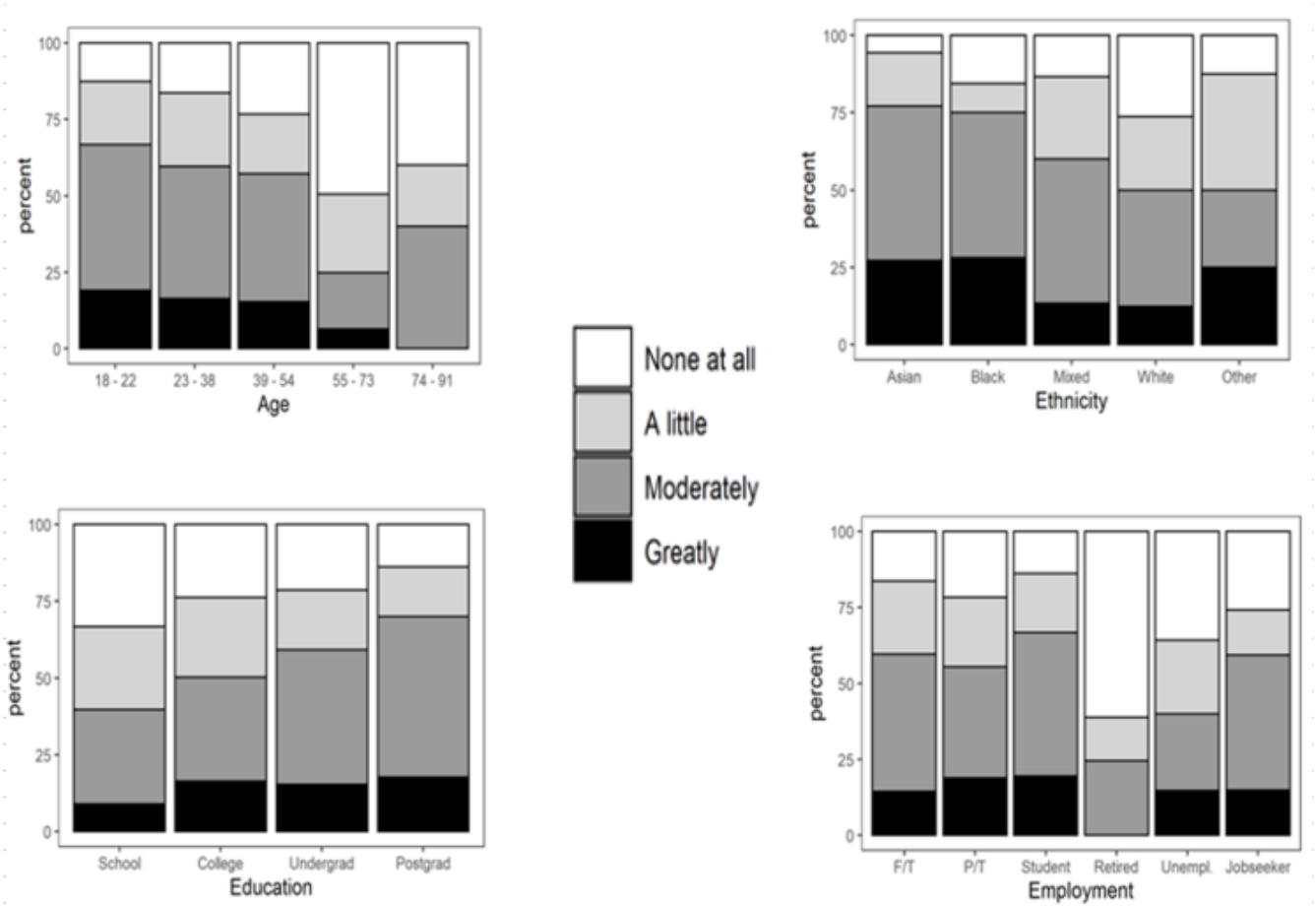

Figure 2. Impact of Covid-19 on the amount of foods purchased by participants grouped by age, ethnicity, level of education and employment status (Question 4).

The level of education of the participants also showed a significant variation on how the amount of foods bought during the pandemic was greatly affected. While the participants with the lowest level of education were the least affected, postgraduate qualification holders had the highest impact. A significant difference was seen on how the pandemic greatly affected the amount of foods bought by the secondary school qualification and college qualifications holders. Only 1% difference was seen between participants with college and first degree (undergraduate) qualifications. In addition, the participants who were students had the greatest effect of Covid-19 pandemic on the amount of foods purchased was measured on employment status. The amount of the foods bought by the retirees during the pandemic were also the least affected, and about 57% of them claimed that they were not affected at all.

(b). Effects of Covid-19 on participants attitude to the consumption of food supplements (Question 5)

Although the degree of importance of taking food supplements and products that strengthen the immune system during the Covid-19 pandemic varied among people from the Black, Mixed and 'Other' ethnic groups, all the participants said that taking food supplements to support the immune system is important. The 12.55% of the participants that said food supplements are 'not important at all' were from the White ethnic group (21%) and a very few were from Asian and Asian British ethnic group (1.8%). Apart from the participants that were from 'Other' ethnic group such as the Arabs, the greatest importance was given to taking of food supplements by people from mixed or multiple

ethnic groups, followed by people from the Black and Asian ethnic groups, as shown in Fig. 3.

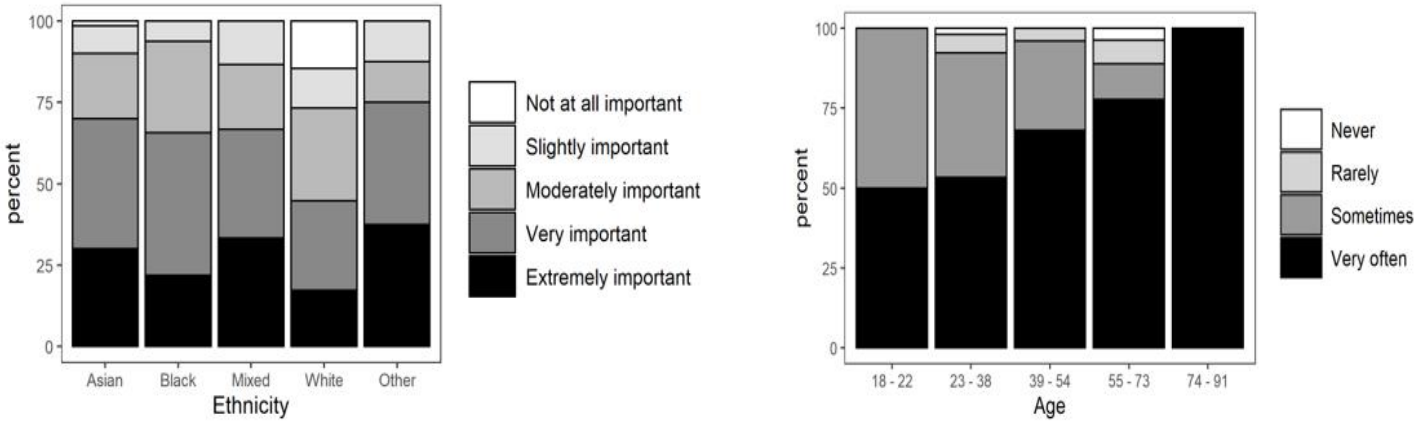

Figure 3. Effects of Covid-19 pandemic on the choice of food supplements and products that boost the immune system grouped by ethnicity and age (Question 5).

(c). Effects of Covid-19 on food purchasing decision of the participants (Question 6)

As shown in Fig. 4, the decision to purchase healthier foods was least affected by Covid-19 in participants within the oldest age groups (55-73 and 74-91). Participants whose ages were from 23 to 38 had the greatest effect of Covid-19 on their purchasing decision of healthier foods, followed by participants in the 18 –22 group. While the participants from the Asian or Asian British or any Asian background, (for example, Bangladeshi, Chinese, Indian, Pakistani) had the greatest effect of Covid-19 on food purchasing decisions, and those from the White backgrounds were least affected.

All the participants who were not from Asian, Black, Mixed and White ethnic groups, had their decisions on purchasing healthier foods affected by Covid-19 pandemic. Although people from mixed or multiple ethnic groups have the lowest number of participants who said Covid-19 greatly affected their decision on the choice of healthier foods, a considerable number of them had their decisions affected 'moderately or a little bit'. Among the Black participants, (Black African, Black British or Caribbean, this includes any Black background), the percentage of people that Covid-19 affected their decision on healthier foods moderately and a little bit are lower than Asian participants but higher than participants from White ethnic group (this includes any White background).

In terms of employment status, Covid-19 had the greatest impact on the students' decision of buying healthier foods when compared with the retirees and people in work. About 50% of the retirees who took part in the survey said that Covid-19 did not affect their decision to buy healthier foods, and they were generally least affected by Covid-19 in choosing healthier foods. Almost the same number of people in full time and part time employment said that the pandemic affected their food decisions greatly, but people in full time employment whose decisions on food choice were moderately affected were more than those in part time jobs. The majority of the participants who were looking for jobs (Jobseekers) said that Covid-19 affected their purchasing decision 'moderately or a little bit'.

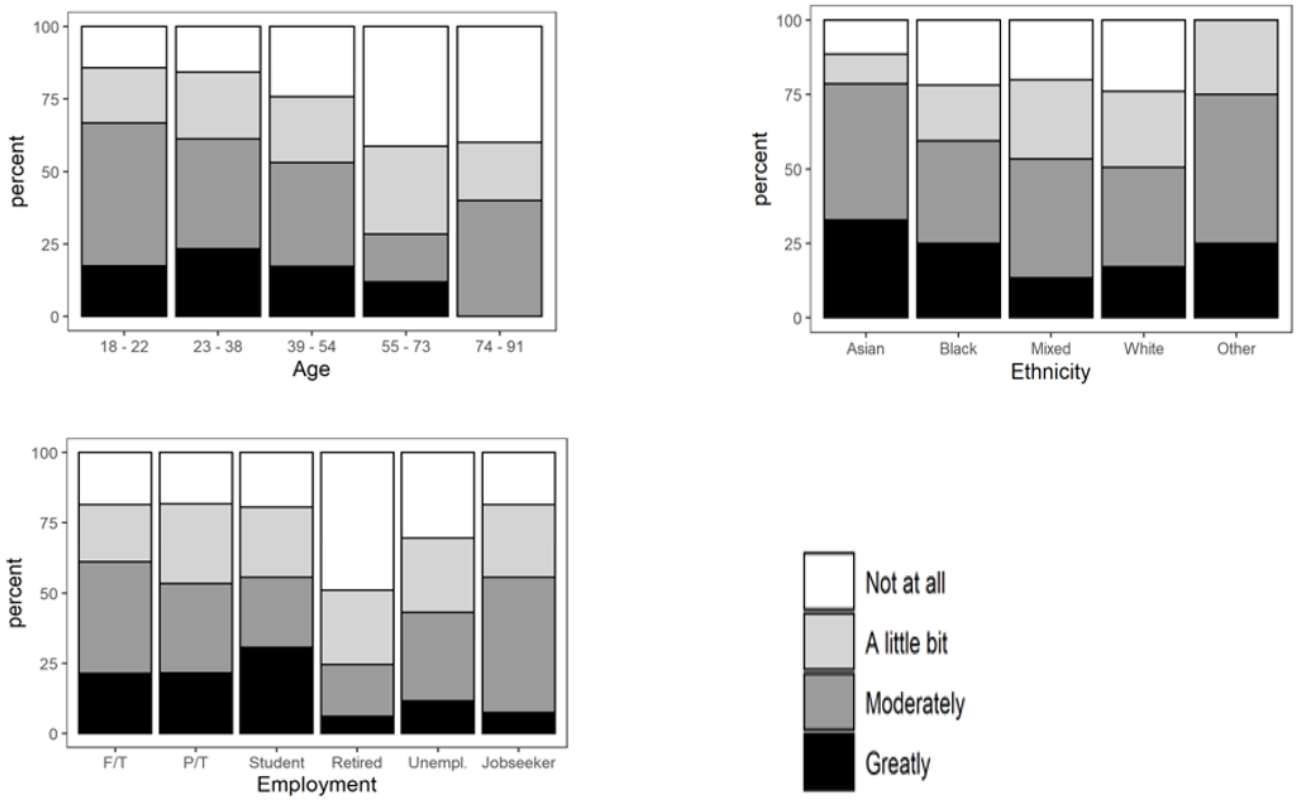

Figure 4. Effects of Covid-19 pandemic on purchasing decision of healthier foods grouped by age, ethnicity, and employment status (Question 6).

4. Discussion

The current study demonstrated that eating and purchasing habits were influenced significantly during the Covid-19 pandemic, which can be observed clearly when responses are classified according to sociodemographic factors. These effects support the findings of Kaya,[22] on how socio-economic and demographic variables affect consumers` knowledge and attitudes. The effects of the pandemic on the eating and purchasing habits are grouped as follows.

(a). Age

The outcome of the use of common sense by the food retailers to give priority to the elderly people during shopping hours during the Covid-19 pandemic by the UK government can be inferred from the current study. Our data revealed that the amount of food and food products purchased by people who were in 55-70 years and 74-91 age groups were affected during the pandemic. Beyond the use of common sense, instead of rejecting the petition,[23] that should have given the elderly more privileges to access the supermarkets by the UK's parliament, our results suggest the need for government policy and framework on how the purchase of healthier foods by the elderly can be made easier in similar situations. The hypothesis that the decision to buy food supplements and food products that support the immune system would be greatly affected with increasing age could not be justified. This is because the significant difference observed in consumers` attitudes to the consumption of food supplements and foods that support immunity was only related to ethnicity and did not vary significantly among the age groups. The participants aged 74-91 were least affected by Covid-19 on their decisions to buy healthier foods.

Nonetheless, the assertions of Johansen,[24] and Oakes & Slotterback,[25] that the elderly consumers are conscious of their health than the young ones reflected in the results. While the elderly consumers prioritise the healthiness of their diets, the younger consumers were said to focus on the effects of their foods on personal appearance and weight control,[25].

(b). Education level

A study carried out with the residents of England reported that education level had an impact on eating behaviours, with a greater influence on people with lower qualifications, [26]. It was therefore expected that people with higher qualifications could not be greatly affected by the Covid-19 pandemic in terms of making decisions on the amount and type of healthier foods purchased. Contrary to our opinion, the participants with the highest level of education in this study were the most affected. This may be because the participants with highest qualifications are likely to be more health conscious and obliged to buy more/greater variety of healthier foods. The higher likelihood of people with higher educational qualifications to be gainfully employed and to earn good income is also significant in making food choices. For example, the limited income of people with lower education has been linked with the consumption of energy-dense unhealthy diets, because those people usually cannot afford to purchase foods of good quality,[27].

The effects of Covid-19 pandemic on the amounts of foods purchased, consumption of food supplements and decision to purchase healthier foods by students who were 18 years and above were not significant across the sociodemographic variables in this study. Nonetheless, other behavioural studies enumerated the sociological effects of Covid-19 on students across all the levels of education ranging from pre-school to tertiary institutions in England,[12,28]. The closure of schools that made children (except those who are vulnerable and whose parents are critical or key workers)[6] to stay at home during the lockdown was reported to affect the eating routines of many school children.

(c). Employment status

The purchasing habits and decisions on choice of healthier foods were least affected in the older adults who were in the age groups (55-73 and 74-91) and those who were unemployed. This outcome is similar to that of the University of Michigan's National Poll on Healthy Aging,[29] where although the in-store food purchases were found to reduce among older consumers who were between 50 to 80 years during the Covid-19 pandemic, but nonetheless, no significant negative effects of the pandemic were recorded on their eating behaviours. The effects of the Covid-19 pandemic were observed differently on the nutrition and activities of the Dutch older adults, where a substantial negative impact was seen on the dietary habits,[30].

Our survey could not justify why the eating and purchasing habits of the unemployed and older adult participants were least affected by the Covid-19 pandemic. This finding is contrary to the outcome of a qualitative study conducted in England, where all the participants whose eating behaviours were greatly affected before the Covid-19 pandemic were not in employment,[31]. However, the social assistance supports received from the government could have helped them to maintain their dietary behaviours,[32,33].

(d). Gender

[6] https://www.gov.uk/government/publications/coronavirus-covid-19-maintaining-educational-provision/guidance-for-schools-colleges-and-local-authorities-on-maintaining-educational-provision

The results did not show any statistical significance in food behaviours and purchasing habits between female, male and those that described themselves in other way. However, a higher number of females (63.89% and mostly from the White ethnic group) participated in the study. This could reflect the attitudes and behaviours of women and men toward food shopping and consumption, with high likelihood of women participating in food and consumers related surveys than men,[34].

(e). Ethnic group

The reasons why Covid-19 greatly affected BAME participants in terms of decision making and purchasing of healthier foods were not clear, but these may be as a result of factors such as social, economic, or cultural,[35]. The reported public health inequalities that are facing the ethnic minorities also manifest in the risk and effects of Covid-19 pandemic, and these health inequalities require urgent government attention and more empirical evidence- based studies,[36]. Unlike studies in countries like Italy, Poland, Germany, Denmark and Qatar,[6,30,37,38] that measured the effect of Covid-19 pandemic on the diet behaviours among different ethnic groups, most available scientific findings on UK residents are epidemiological and clinical data,[12,35]. In fact, empirical studies that adequately measure the effect of Covid-19 on the eating and purchasing behaviours based on the sociodemographic characteristics of consumers in the UK are still limited. To the best of our knowledge, this is the first food behaviour study that critically explored the impacts of Covid-19 pandemic on the socioeconomic variables of people that are resident in England.

We could assert from our data that the amount of healthier foods and supplements that consumers buy during Covid-19 pandemic were greatly, moderately or a little bit affected across all the sociodemographic variables. This evidence supports the guidance of the WHO that consumers should consume healthier foods during the pandemic,[2]. Even though 22.22% of the participants claimed that their purchasing decisions were not affected by Covid-19, this was not the same for the remainder (77.78%) of the participants. This effect is also consistent with our hypothesis where we postulated an increase in the purchasing and consumption of healthier foods during the Covid-19 pandemic. The participants' selection in this study was unbiased, randomised, and anonymous. The estimate of the sample size of the target population at a low FDR of 0.0044 and confidence level of 95% (which account for the deviation of the true proportion of the entire population) make the generalisability of the findings of this study to be transferable to the entire population of England.

The main limitation of this study is that enough evidence could not be garnered and theoretically established on why the eating and purchasing behaviours were significantly affected during Covid-19 pandemic, when categorised into sociodemographic variables. For example, the impacts of the factors such as comorbidity and personal experience could not be measured through the study design, qualitative studies that will interact with the participants and provide scientific evidence to justify the effect of Covid-19 on their food behaviours are therefore recommended for future research. We suggest that separate studies should be done in other parts of the UK so that comparisons could be made with the data obtained from England, which is the most populated region.

5. Conclusion

The impacts of Covid-19 pandemic are felt in many areas of people's lives globally, and the way of preventing its spread and effects is attracting researchers' pedagogical approaches. In this study, we have provided data on the impacts of Covid-19 pandemic on food behaviours and consumers habits of people that live in England, stratified according

to their age, gender, education level, ethnicity, and employment status. Although no scientific difference could be measured among the gender, the effects of the pandemic were more noticed in younger generations, participants in full or part time employment, those with higher educational qualifications and participants from the minority ethnic groups. Because Covid-19 pandemic is still ongoing, our data would still need to be worked on in the future to know if the implications of the pandemic on consumers` behaviours and habits are still the same in England, and perhaps in other regions of the UK.

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